

Connection and Operation

Names and Functions of Driver Parts

Speed Potentiometer
Turning the potentiometer clockwise causes the speed to increase.
Speed setting range is 100~2000 r/min.
The setting is 0 r/min at the time of shipment.

RUN/STAND-BY Switch



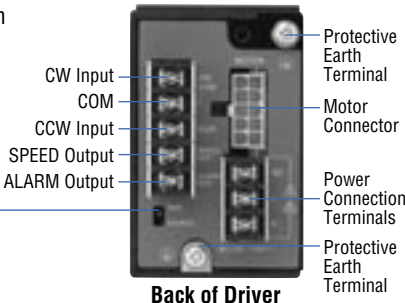
Front of Driver

Input/Output Connection Signal Terminals

Sink/Source-Input Selector Switch

<input checked="" type="checkbox"/> SINK	Set to the SINK side when the sink logic is to be used.
<input type="checkbox"/> SOURCE	Set to the SOURCE side when the source logic is to be used.

*The factory setting is SINK.



Back of Driver

Notes:

- The RUN/STAND-BY switch is not a power ON/OFF switch.
- When you want to stop the motor for an extended period, turn off the driver power.

Motor Connection

Insert the motor cable connector into the motor connector (MOTOR) on the driver. Insert it until a click sound is audible. To extend the distance between the motor and driver, use an optional extension cable. The connection can be extended to a maximum of 10.5 m (34.4 feet).

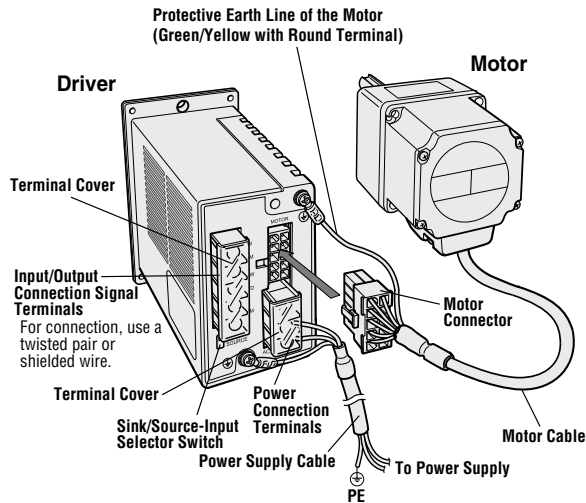
Connect the motor's protective earth line (green/yellow) to the driver, as shown in the figure. If you are using an extension cable or the motor can be accessed directly by hands, connect the protective earth wire from the motor directly to ground. If the protective earth line is not long enough, connect a lead wire of AWG18 (0.75 mm²) or larger to the protective earth line of the motor cable and connect it to ground over the shortest distance. The lead wire must be provided by the user. The optional dedicated extension cable does not come with a protective earth line. If you are using the optional dedicated extension cable, provide grounding at a relay point or extend the cable to an appropriate grounding point.

Power Connection

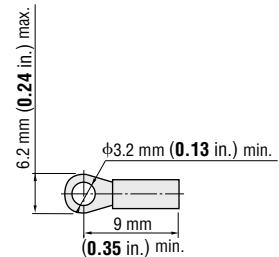
Connect the included power supply cable to the power supply terminal of the driver. Connect the red and black lead wires to the power connection terminals, and green/yellow lead wire to the protective earth terminal. When the included power supply cable is not used, use a cable with a diameter equivalent to AWG22 (0.3 mm²) or more. For the protective earth cable, use a cable with a diameter equivalent to AWG18 (0.75 mm²) or more.

Connection Diagrams

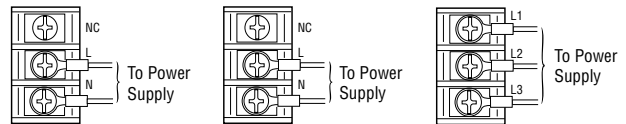
Motor and Driver Connection



- Recommended Crimp Terminals
- Round Terminal with Insulation (M3)



- Single-Phase 100~115 VAC
- Single-Phase 200~230 VAC
- Three-Phase 200~230 VAC

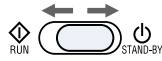


◇ Operation

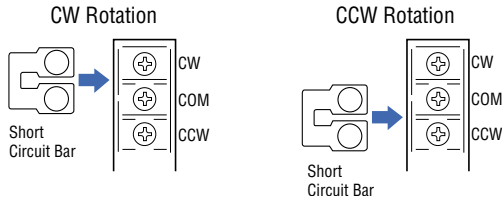
The direction of motor rotation is as viewed from the output shaft end of the motor. "CW" indicates clockwise direction, while "CCW" indicates counterclockwise direction.

· Stand Alone Operation

When the RUN/STAND-BY switch is set to the "RUN" position, the motor will run. When it is set to the "STAND-BY" position, the motor will stop.

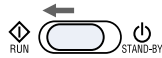


The direction of rotation depends on how the short circuit bar at the back of driver is connected. Connect the short circuit bar between the CW and COM or CCW and COM. Do not use the short circuit bar for any other purpose.



· Operation Using External Signals

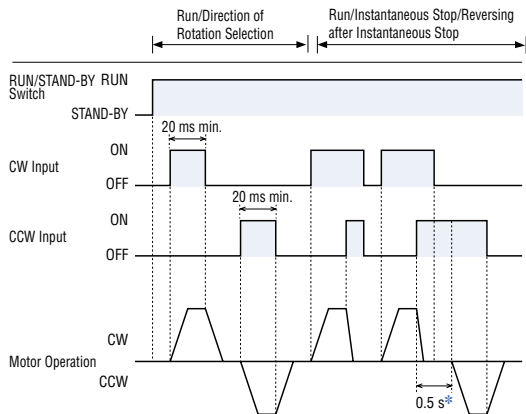
Set the RUN/STAND-BY switch to the "RUN" position.



● See "Input Circuit Connection Example" shown on the page 18 for connection.

● Timing Chart

◇ Operation Using External Signals



Note:
The CW and CCW input signals must be ON for at least 20 ms.

When both the CW and CCW inputs are turned on, the motor stops instantaneously.
*Motor does not run for 0.5 s after instantaneous stop, if a reversing run signal is input.

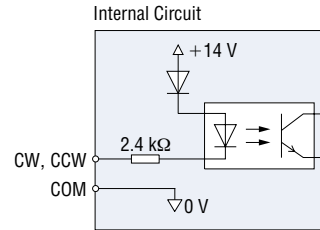
● I/O Signal Circuits

The input signal circuit can be switched between the sink mode and source mode using the sink/source-input selector switch on the driver.

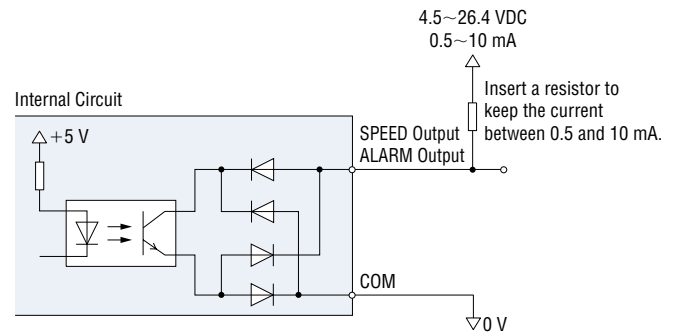
The factory setting is the sink mode.

◇ Sink Logic

· Input Circuit

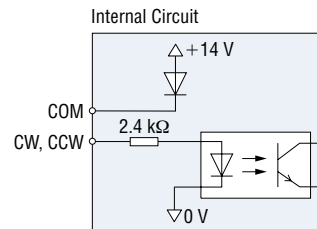


· Output Circuit

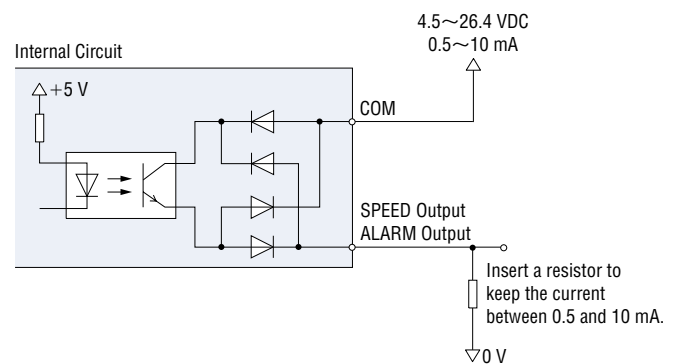


◇ Source Logic

· Input Circuit

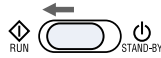


· Output Circuit

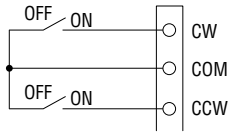


◇ Input Circuit Connection Example

Set the RUN/STAND-BY switch to the "RUN" position.

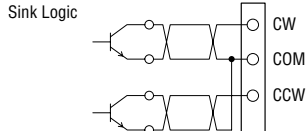


• Small-capacity switch and relay



● Use a small-capacity contact type relay capable of opening and closing 14 VDC, 10 mA.

• Transistor output type controller



● When in the source mode, do not connect the CW input and CCW input to transistor output type controller.

Rotation Direction of Motor

● CW (clockwise) directional operation

When CW input is turned on, the motor runs in a clockwise direction. When CW input is turned off, the motor stops.

● CCW (counterclockwise) directional operation

When CCW input is turned on, the motor runs in a counterclockwise direction. When CCW input is turned off, the motor stops.

When both the CW and CCW inputs are turned on simultaneously, the motor stops instantly. Instantaneous reversing operation is not possible.

◇ When a Controller with a Built-In Clamp Diode is Used

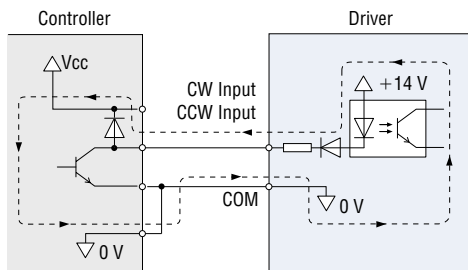
When you want to use the controller with a built-in clamp diode, pay attention to the sequence of turning on or off the power.

Power ON: Controller ON → Driver ON

Power OFF: Driver OFF → Controller OFF

If the driver power is turned on first when connected as shown below, or the controller power is turned off with the driver power turned on, current will be applied, as indicated by the arrows in the diagram. This may cause the motor to run. When the power is turned on or off simultaneously, the motor may run temporarily due to differences in power capacity. The controller power must be turned on first, and driver power must be turned off first.

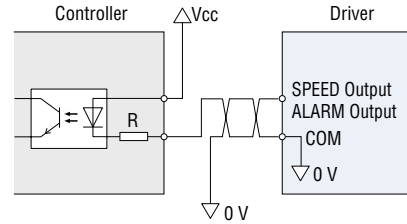
• Example of Sink Logic



◇ Output Circuit Connection Example

The signal output is open collector output. Use the power supply of 4.5 VDC to 26.4 VDC to connect the limit resistor (R) to keep output current between 0.5 mA and 10 mA.

• Signal Output (Sink Logic) Connection Example



Note:

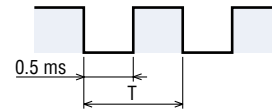
● The ON voltage of the output circuit is approx. 15 V. Remember this specification when driving other element using the output circuit.

◇ SPEED Output

The speed output signal is synchronized with the motor speed. The system outputs pulses (with a width of approximately 0.5 ms) at a rate of 30 pulses per rotation of the motor output shaft. You can measure the speed output frequency and calculate motor speed.

$$\text{Motor Speed (r/min)} = \frac{\text{SPEED Output Frequency [Hz]} \times 60}{30}$$

$$\text{SPEED Output Frequency (Hz)} = \frac{1}{T}$$



● To display or monitor the speed of the motor output shaft or the reduced speed of the gearhead output shaft, use an optional **SDM496** motor speed indicator (the **SDM496** can be used only when the sink logic is selected). Motor Speed Indicator → Page 25

Notes for Connection:

● When you want to extend the input/output signal cable, the length must not exceed 2 m. The cable should be as short as possible in order to minimize noise.

● Signal wires and motor wires should be kept away from power cables or motor cables.

◇ALARM Output

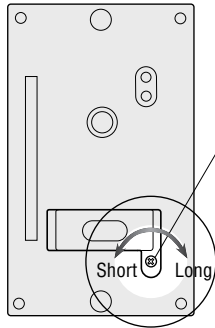
In the following conditions, the driver's protective function will actuate. The ALARM output will turn OFF and the motor will stop. In this case, the protective function that actuated can be checked based on whether the LED is blinking or illuminated steadily.

- The LED will blink upon actuation of the following protective function:
 - Overload protective function
- The LED will illuminate steadily upon actuation of the following protective functions:
 - Overvoltage protective function, motor sensor error, undervoltage protective function, overspeed protective function

●Setting the Acceleration/Deceleration Time

The motor accelerates slowly when it starts up and decelerates slowly when it stops. This acceleration/deceleration time can be set within the range from 0.5 to 10 sec (2000 r/min without load). The time can be set using the acceleration/deceleration potentiometer. Remove the front panel of the driver to access the potentiometer.

*The figure shows the driver with the front panel removed.



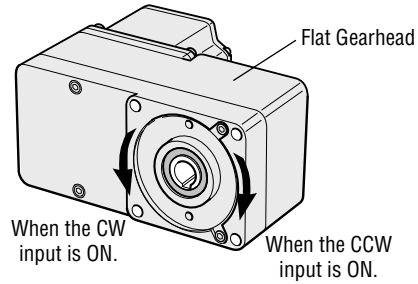
Acceleration/Deceleration Time Potentiometer

Time is increased by turning the switch clockwise. Use an insulated Phillips Screwdriver for this operation. The shortest time is selected at the time of shipment.

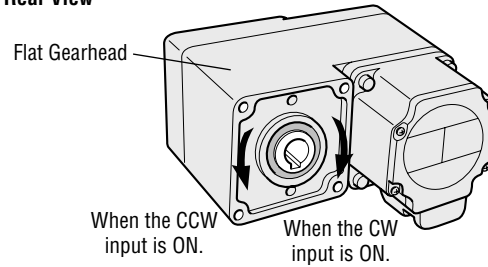
■Rotation Direction of the Hollow Shaft Flat Gearhead

The hollow shaft flat gearhead of the combination type rotates in the direction as shown below, with respect to the direction input from the driver.

Front View



Rear View



Installation of the Hollow Shaft Flat Gearhead

Installing the Load Shaft

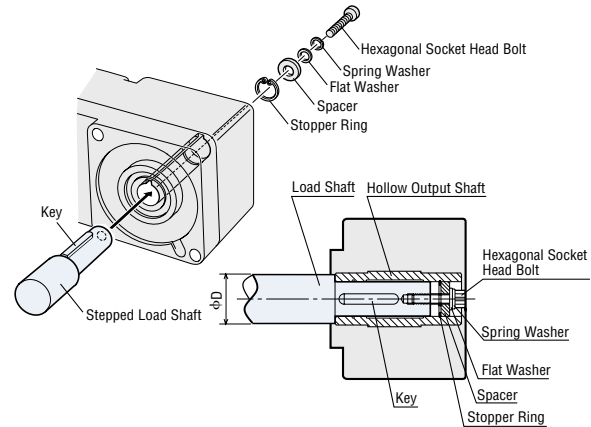
- Install the load shaft to the hollow output shaft by aligning the center of the hollow shaft with that of the load shaft.
- The hollow output shaft has a key slot. Machine a matching key slot on the load shaft and use the supplied key to affix the two shafts across the slots.
- A recommended tolerance of the load shaft is h7.
- If the motor is intended to receive large impacts due to frequent instantaneous stops or carry a large overhung load, use a stepped load shaft.

Notes:

- When installing the load shaft to the hollow output shaft, be careful not to damage the hollow output shaft or bearing.
- To prevent seizure, apply a coat of molybdenum disulfide grease on the exterior surface of the load shaft and interior surface of the hollow output shaft.
- Do not attempt to modify or machine the hollow output shaft. Doing so may damage the bearing and cause the hollow shaft flat gearhead to break.

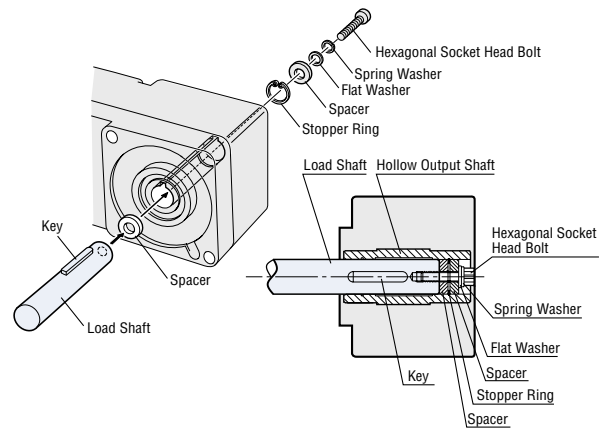
Stepped Load Shaft

Install a hexagonal socket head bolt over a stopper ring, spacer, flat washer and spring washer, and tighten the bolt to affix the load shaft.



Straight Load Shaft

Install a hexagonal socket head bolt over a stopper ring, spacer, flat washer and spring washer, with a spacer also inserted underneath the load shaft, and tighten the bolt to affix the load shaft.



Recommended Load Shaft Installation Dimensions

Unit = Upper value: mm/Lower value: inch

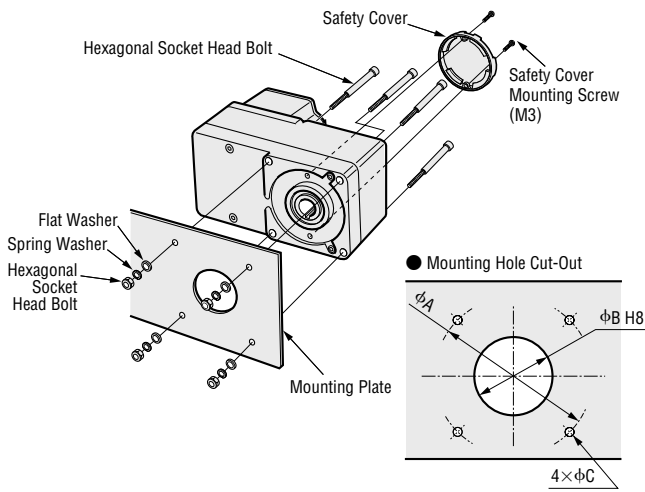
Model	BLU220	BLU440	BLU590
Inner Diameter of Hollow Shaft (H8)	$\phi 12^{+0.027}$ $\phi 0.4724^{+0.0011}$	$\phi 15^{+0.027}$ $\phi 0.5906^{+0.0011}$	$\phi 20^{+0.033}$ $\phi 0.7874^{+0.0013}$
Recommended Tolerance of Load Shaft (h7)	$\phi 12^{-0.018}$ $\phi 0.4724^{-0.0007}$	$\phi 15^{-0.018}$ $\phi 0.5906^{-0.0007}$	$\phi 20^{-0.021}$ $\phi 0.7874^{-0.0008}$
Nominal Diameter of Stopper Ring	$\phi 12$, C-shaped $\phi 0.47$	$\phi 15$, C-shaped $\phi 0.59$	$\phi 20$, C-shaped $\phi 0.79$
Applicable Bolt	M4	M5	M6
Spacer Thickness*	3 0.12	4 0.16	5 0.20
Outer Diameter of Step Part ϕD	20 0.79	25 0.98	30 1.18

*Determine the spacer thickness in conformance with the table. If the spacer is thicker than the specified dimension, the bolt will project from the surface and interfere with the safety cover.

● Installing the Hollow Shaft

◇ Installing from the Front Face

The output shaft boss (h8) can be used to align the shaft.

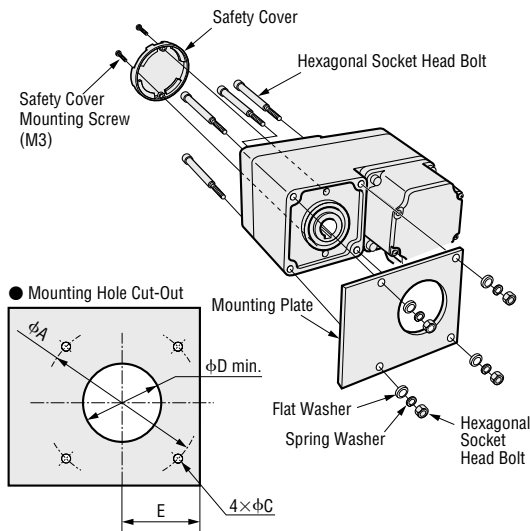


Mounting Hole Dimensions

Unit = Upper value: mm/Lower value: inch

Model	BLU220	BLU440	BLU590
Nominal Bolt Size	M5	M6	M8
φA	70 2.76	94 3.70	104 4.09
φB H8	34 ^{+0.039} ₀ 1.34 ^{+0.0015} ₀	38 ^{+0.039} ₀ 1.50 ^{+0.0015} ₀	50 ^{+0.039} ₀ 1.97 ^{+0.0015} ₀
φC	5.5 0.217	6.5 0.256	8.5 0.335
φD	25 0.98	30 1.18	35 1.38
E	29 1.14	39 1.54	44 1.73

◇ Installing from the Rear Face



Note:

- When installing the hollow shaft flat gearhead from the rear face, provide dimension E to prevent the mounting plate from contacting the motor.